

SECTION 02510

WATER DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

1.2 SUMMARY

- A. This Section includes the following Water main materials and methods:
 - 1. Water Main
 - 2. Fire Hydrants
 - 3. Sectional Valves
 - 4. Post Indicator Valves
 - 5. Fittings
 - 6. Lining Water Main

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Water Main and Fittings
 - 2. Valves and accessories.
 - 3. Water Main Lining
 - 4. Backflow preventers and assemblies.
 - 5. Protective enclosures.
 - 6. Fire hydrants.
 - 7. Domestic hydrants.
- B. Shop Drawings: For the following:
 - 1. Precast concrete vaults, including frames and covers, ladders, and drains.
 - 2. Water Main Lining
- C. Field Quality-Control Test Reports: For Water Main Lining.
- D. Operation and Maintenance Manuals: For specialties to include emergency, operation, and maintenance manuals. Includes the following:
 - 1. Water meters.
 - 2. Valves.

3. Backflow preventers.
4. Protective enclosures.
5. Fire hydrants.
6. Domestic hydrants.

1.4 QUALITY ASSURANCE

- A. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
- B. Comply with FM's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- C. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
- D. NSF Compliance:
 1. Comply with NSF 14 for plastic potable-water-service piping
 2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- B. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- C. Protect flanges, fittings, and specialties from moisture and dirt.
- D. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

PART 2 - PRODUCTS

2.1 WATER PIPE AND ACCESSORIES

- A. PVC, AWWA Pipe: AWWA C900, Class 150 for domestic service lines and Class 200 for high pressure service lines with bell end with gasket and spigot end.
 1. Comply with UL 1285 for fire-service (high pressure) mains.
 2. PVC Fabricated Fittings: AWWA C900, Class 150 and Class 200 as applicable, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
 3. Blue colored detectable blue metal warning tape 12-inch (minimum) - 18- inch (maximum) below grade.
 4. PVC Molded Fittings: AWWA C907, Class 150 or Class 200 as applicable, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
 5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

- a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- B. Ductile Iron Pipe and Fittings: AWWA C151: C104: C105: C110: C111: C150: C153.
 - 1. Ductile iron or cast iron fittings if required shall conform to AWWA C110 or C153. Adapters shall be provided for transition to pipe of other material.
 - 2. Ductile iron pipe (DIP) shall be special thickness Class 52, cement mortar lined in conformance with AWWA C104 and encased in conformance with AWWA C105.
 - 3. Ductile iron pipe shall be designed in accordance with AWWA C150 thickness design and AWWA C151 and shall be installed in accordance with AWWA C600.
 - 4. Ductile iron pipe shall be Push Joint and shall conform to the requirements of AWWA C110 and AWWA C111.
- C. Accessories
 - 1. Concrete for Thrust Restraints: Concrete type specified in Division 3.
 - 2. Castings shall conform to the requirements of ASTM A48, Class 35C.

2.2 JOINING MATERIALS

- A. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.
- B. Ductile-Iron-Pipe Gaskets, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.
- C. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
 - 1. Sleeve: ASTM A 126, Class B, gray iron.
 - 2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
 - 3. Gaskets: Rubber.
 - 4. Bolts and Nuts: AWWA C111.
 - 5. Finish: 2 – 5 mil coats of epoxy for a total dry thickness of 10 mils

2.3 CORROSION-PROTECTION ENCASEMENT FOR PIPING

- A. Polyethylene Wrap: ASTM A 674 or AWWA C105, PE film, 0.008-inch minimum thickness, tube or sheet. For use in limited areas where ductile iron pipe is installed. Wrap all ductile iron fittings when in contact with concrete thrust blocks.

2.4 SECTIONAL VALVES

- A. AWWA C515, Ductile-Iron Gate Valves:
 - 1. Manufacturers:
 - a. American Cast Iron Pipe Co.; American Flow Control Div.
 - b. Other Pre-approved Equal

2. Nonrising-Stem, Resilient-Seated Gate Valves: AWWA C515, ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.
 - a. Standard Working Pressure: 250 psig
 - b. End Connections: Mechanical joint.
 - c. Interior Coating: Complying with AWWA C550.
 - d. Valves shall have stainless steel bolts.

3. Gate valves shall be ductile iron body, bronze mounted, resilient seat with non-rising stems in accordance with AWWA C515.
 - a. Gate valves shall have flanged mechanical joints ends for connection to water main unless otherwise shown and gate valve shall have "O" ring stem seals.
 - b. Coat all ferrous valve components not coated with elastomers except fasteners with two coats of fusion bonded or two part liquid epoxy meeting AWWA C550 and NSF61, 5 mils per coat, for a total dry film thickness of 10 mils. Damage to coating during transportation and/or installation should be repaired in accordance with the coating manufacturer's recommendations.
 - c. Valve boxes shall be provided for all buried valves.
 - 1) Valve boxes shall be one complete assembled unit composed of the box, extension stem to grade, and a self-centering alignment ring for the base section. All moving parts of the extension stem to be enclosed in a housing to prevent contact with the soil. The assembly shall be adjustable to accommodate variable trench depths. Length adjustment of the assembly is through the use of a compression collar.
 - 2) The upper and lower pipe shall be made of minimum 1/4" heavy wall high-density polyethylene. All components to be hinged with a permanent locking design. The top section must be adaptable to fit inside a standard valve box upper section. The bottom base flange to be compatible to normal UL/FM indicator post mounting plate.
 - 3) The stem assembly shall be a telescoping design to allow variable adjustment length in the field. Stem material to be galvanized steel square tubing and torque tested to 1,000 foot-pounds. A built-in device that keeps the stem assembly from disengaging at the fully extended length is required. Screw type valve boxes are not allowed. The valve box assembly shall be equivalent to the American Flow Control's TRENCH ADAPTER.

B. AWWA C-504 Ductile Iron Butterfly Valves (16 inch and larger)

1. Designed for 250 psig working pressure
2. 2" operating nut opening counter clockwise
3. Valve ends shall be mechanical joint
4. Valves shall have stainless steel bolts
5. Butterfly valves shall be ductile iron body, bronze mounted in accordance with AWWA C504.
 - a. Gate valves shall have mechanical joints for connection to water main unless otherwise shown and gate valve shall have "O" ring stem seals.
 - b. Valve boxes shall be provided for all buried valves.
 - 1) Valve boxes shall be one complete assembled unit composed of the box, extension stem to grade, and a self-centering alignment ring for the base section. All moving parts of the extension stem to be enclosed in a housing

to prevent contact with the soil. The assembly shall be adjustable to accommodate variable trench depths. Length adjustment of the assembly is through the use of a compression collar.

- 1) The upper and lower pipe shall be made of minimum ¼" heavy wall high-density polyethylene. All components to be hinged with a permanent locking design. The top section must be adaptable to fit inside a standard valve box upper section. The bottom base flange to be compatible to normal UL/FM indicator post mounting plate.
 - 2) The stem assembly shall be a telescoping design to allow variable adjustment length in the field. Stem material to be galvanized steel square tubing and torque tested to 1,000 foot-pounds. A built-in device that keeps the stem assembly from disengaging at the fully extended length is required. Screw type valve boxes are not allowed. The valve box assembly shall be equivalent to the American Flow Control's TRENCH ADAPTER.
- c. Each valve shall have two coats of manufacturers standard epoxy, 5 mils per coat, for a total dry film thickness of 10 mils. Damage to coating during transportation and/or installation should be repaired in accordance with the coating manufacturer's recommendations.

2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

- A. Valve Boxes: Valve boxes shall be provided for buried valves. Valve boxes shall be one complete assembled unit composed of the box, extension stem to grade, and a self-centering alignment ring for the base section. All moving parts of the extension stem to be enclosed in a housing to prevent contact with the soil. The assembly shall be adjustable to accommodate variable trench depths. Length adjustment of the assembly is through the use of a compression collar.

The upper and lower pipe shall be made of minimum ¼" heavy wall high-density polyethylene. All components to be hinged with a permanent locking design. The top section must be adaptable to fit inside a standard valve box upper section. The bottom base flange to be compatible to normal UL/FM indicator post mounting plate.

The stem assembly shall be a telescoping design to allow variable adjustment length in the field. Stem material to be galvanized steel square tubing and torque tested to 1,000 foot-pounds. A built-in device that keeps the stem assembly from disengaging at the fully extended length is required. Screw type valve boxes are not allowed. Cover shall have lettering "WATER". Provisions shall be made to include valve number on trench adapter via a permanent marking approved by the government. Valve number shall not be shown on cover.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.
- B. Indicator Posts: UL 789, FM-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.
1. Indicator posts shall be labeled with the new valve number. Hydra-tag tagging system available through assured flow sales, inc. shall be utilized.

2.6 CORPORATION VALVES AND CURB VALVES

- A. Manufacturers:
 - 1. Ford Meter Box Company, Inc. (The).
 - 2. Grinnell Corporation; Mueller Co.; Water Products Div.
 - 3. McDonald, A. Y. Mfg. Co.
- B. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.
 - 1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
 - 2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
 - 3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.
- C. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

2.7 CONCRETE

- A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858.
- B. Ladder: ASTM A 36/A 36M, steel or polyethylene-encased steel steps.
- C. Manhole: ASTM A 48, Class No. 35 (ASTM A 48M, Class No. 250) minimum tensile strength, gray-iron traffic frame and cover (medium duty) 24 inch minimum diameter.
 - 1. Dimensions: Not smaller than 48-inch diameter, unless otherwise indicated.
- D. Drain: ASME A112.21.1M, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.8 FIRE HYDRANTS

- 1. Fire hydrants shall conform to the requirements of ANSI/AWWA C502 *AWWA STANDARD FOR DRY-BARREL FIRE HYDRANTS* or the latest revision thereof and the following provisions. Hydrant that requires a pumper outlet shall be furnished with 5-inch "Hydra-Storz" quick connect on pumper outlet and Hydra-Snap-Cap. All hydrants shall be provided with hydra-Tag, brass tag attached at bonnet bolt. Tag shall be as manufactured by Assured Flow, Inc. and shall include new hydrant number. Furnish affidavit of compliance with AWWA C502 and these specifications. Design hydrants for 200 psi working pressure.
 - a. Basic design shall be dry barrel type, which prevents the operating threads from coming into contact with the service water. It shall be of the compression type, opening against the pressure and closing with the pressure.

- b. Hydrant bonnet assembly shall be provided with a sealed grease reservoir and lubrication system that automatically circulates lubricant to all operating stem threads and bearing surfaces each time the hydrant is operated. The system shall be completely sealed from the waterway and from external contaminants with O-rings.
- c. The hydrant will be of the traffic 'breakaway' type with safety stem coupling and breakable flange that permits full 360 degrees rotation of the nozzle section. Lower barrel section and base shall be made of ductile iron.
- d. Main valve opening of the hydrant shall not be less than 5 1/4". Provide rubber O-ring seals around the seat ring. Hydrant valve assembly to consist of three parts. The valve top and bottom are to be interlocked with the valve top being locked with the valve rod using a stainless steel cotter pin. The hydrant valve rubber shall be EPDM and located between the valve top and bottom.
- e. Hydrant nozzle configuration shall consist of two (2) hose nozzles and one (1) pumper nozzle. High pressure fire hydrants shall be supplied without the pumper nozzle. Threads on nozzles will conform to existing thread specifications for this utility. All nozzles shall be field replaceable without special tools.
- f. The hydrant will be so designed to permit the removal of all working parts from the hydrant up through the barrel without disturbing the earth around the hydrant and without disassembling the barrel or nozzle section.
- g. An all bronze hydrant valve seat ring shall thread directly into an all bronze drain ring and shall be located between the lower hydrant barrel and base securely retained in this position. No tubular bushed drains will be allowed in the base of the hydrant. The valve seat ring and drain ring shall have no less than two (2) bronze drain ports and four (4) bronze drain outlets. The drain mechanism shall be completely closed after no more than three turns of the operating nut using a spring activated, compression drain system. No sliding drains are allowed.
- h. The hydrant shall have an anti-friction bearing so located that it will reduce the torque required to operate the hydrant.
- i. The operating stem, safety stem coupling and main valve assembly shall be capable of withstanding an application of 200 ft. lbs. of torque against either the full open or closed position with no damage to components. Downward stem travel shall be limited by a travel stop located in the upper housing of the hydrant. Operating stem shall be square and designed to be part of the assembly for seat removal.
- j. Operating nut and nozzle cap wrench nuts shall conform to existing specifications for this utility. The opening between the operating nut and dome shall have a resilient weather shield.
- k. Friction losses through the hydrant shall not exceed 3.0 psi at 1000 gpm (through a 5" pumper connection) when flow tested in accordance with AWWA C502, as evidenced by a certified friction loss graph from the manufacturer and applicable to the specific model to be furnished. An independent testing laboratory on a production hydrant shall conduct flow testing and that laboratory shall establish pressure drops. All hydrants shall be shop tested in accordance with AWWA C502. Fire hydrants shall be the American-Darling 5 1/4" B84B or equivalent.
- l. Hydrants shall have mechanical joints unless otherwise indicated in the specifications.
- m. Hydrants shall have a minimum main valve opening equal to five and one half (5-1/2) inches unless otherwise specified.
- n. Hydrants shall have an inlet opening equal to the size of the supplying water main.
- o. Hydrants shall have adequate bury length to connect to water main (minimum of 5'-6").

- p. Hydrants shall have two 2-1/2" hose outlets and one 4" pumper outlet. Pumper outlet not required on high pressure fire hydrants.
- q. Hydrants shall open by turning in a counterclockwise direction.
- r. Each fire hydrant shall have two coats of manufacturers standard epoxy, 5 mils per coat, for a total dry film thickness of 10 mils. Damage to coating during transportation and/or installation should be repaired in accordance with the coating manufacturer's recommendations. Glass beads shall be used in the above grade portion of the hydrant paint. Hydrants shall be painted with tan barrel and brown bonnet and nozzle caps. Tan shall match Sherwin Williams 30450 flat finish and brown shall match Sherwin Williams 30108 stain finish.
- s. All underground metallic couplings used to connect the fire hydrant and valves should be cleaned and coated with a sprayed or brush-on application of epoxy that is compatible with the factory applied coating. Dry film thickness shall be 10 mil. Cleaning and coating of the couplings should be accomplished in accordance with the coating manufacturer's recommendation. A copy of the manufacturer's application procedure must be included with submittals.
- t. Hydrants shall have "O" ring seals.
- u. Hydrants shall be the break-away traffic type.
- v. Hydrants shall be independently valved and the connecting pipe between the supply main and the hydrants shall be 6-inches in diameter.
- w. Interior coating shall be fusion-bonded epoxy or two-part liquid epoxy meeting AWWA C550 and NSF 61. Fusion bonded epoxy shall have a 10 mil dry film thickness. The two-part epoxy will be applied in two 4 to 5 mil DFT coats.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to Section #02250 "Trench Excavation, Backfilling, and Compacting".

3.2 JOINT CONSTRUCTION

- A. Make pipe joints according to the following:
 - 1. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
 - 2. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.3 PIPING INSTALLATION

- A. Make connections larger than NPS 2 (DN 50) with tapping machine according to the following:
 - 1. Install tapping sleeve and tapping valve according to MSS SP-60.
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.

3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
 4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- B. Make connections NPS 2 (DN 50) and smaller with drilling machine according to the following:
1. Install service-saddle assemblies and corporation valves.
 2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
 3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
 4. Install corporation valves into service-saddle assemblies.
 5. Install manifold for multiple taps in water main.
 6. Install curb valve in water-service piping with head pointing up and with service box.
- C. Comply with NFPA 24 for all water main piping materials and installation.
- D. Install PVC, AWWA pipe according to AWWA M23 and ASTM F 645.
- E. Bury piping with depth of cover over top at least 60 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
1. Under Driveways: With at least 60 inches cover over top.
- F. Install piping by tunneling, jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- G. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.4 ANCHORAGE INSTALLATION

- A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
 2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
 3. Fire-Service-Main Piping: According to NFPA 24.
- B. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.5 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

- C. Water-Regulating Valves: Install in vault between shutoff valves. Install full-size valved bypass.

3.6 BACKFLOW-PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install backflow preventers with relief drain in vault or other space subject to flooding.
- C. Do not install bypass piping around backflow preventers.
- D. Support 2 1/2 inch and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.7 FIRE HYDRANT INSTALLATION

- A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints and thrust blocks, and support in upright position.
- B. AWWA-Type Fire Hydrants: Comply with AWWA M17.

3.8 CONNECTIONS

- A. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.
- B. Connect water-distribution piping to interior domestic-water and fire-suppression piping.

3.9 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.
 - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

3.10 IDENTIFICATION

- A. Install continuous underground detectable metallic warning tape during backfilling of trench for underground water-service piping. Locate eight inches below finished grade, directly over piping.
- B. Install continuous #12 tracer wire on all new water main. Refer to detail in plans.

3.11 CLEANING

- A. Clean and disinfect water-distribution piping as follows:
 - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - 2. Use purging and disinfecting procedure described in AWWA C651 or as described below:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
 - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
 - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 - d. Submit water samples in sterile bottles to state approved testing lab for bacteriological tests. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging and disinfecting activities and submit to Contracting Officer or designated representative.

END OF SECTION 02510